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NOTICE.—Owing to the increasing cost of the *Aëronautical Journal*, the Annual Subscription has been raised to Six Shillings.

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[*For the opinions expressed in papers that are signed or initialled, the Authors alone are responsible. None of the papers or paragraphs must be taken as expressing the opinion of the Council unless such is expressly stated to be the case.*]

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NOTICES
OF
The Aëronautical Society of Great Britain

At a Council Meeting of the Aëronautical Society of Great Britain, held at 53, Victoria Street, Westminster, on Thursday, May 20, 1909.

1. The undermentioned ladies and gentlemen were elected members of the Society:

MR. J. HUMPHREYS
MR. LEO JEZZI
MR. E. A. DAVIES
MR. E. PITMAN
MR. C. LORENZEN
CAPT. A. D. CARDEN, R.E.
MISS M. REAVELY
MR. HORATIO PHILLIPS
PROF. L. R. WILBERFORCE
MISS W. M. FULLERTON
COL. H. E. RAWSON, R.E.
CAPT. E. L. HUNT
CAPT. E. G. M. SHORT
MR. ALLAN S. QUARTERMAINE

To date May 20, 1909.

2. It was decided to hold Annual General Meetings for discussing matters connected with the general welfare of the Society.

The first of the meetings to be held in January, 1910.

The arrangements for such meetings will be duly notified later on.

At a Council Meeting of the Aëronautical Society of Great Britain, held at 53, Victoria Street, Westminster, on Thursday, July 1, 1909.

1. The undermentioned gentlemen were elected members of the Society:

MR. J. NEALE

MR. C. G. GREY

MR. A. V. ROE

CAPT. W. G. WINDHAM

SURGEON LT.-COL. H. R. O. CROSS

To date July 1, 1909.

2. It was decided to form a Committee to consider aëronautical phraseology.

Members who are willing to serve on this Committee are requested to forward their names to the Hon. Secretary as early as possible.

MISCELLANEOUS NOTICES

1. The Council desire to thank the donors for the following books, papers, etc., presented by them:

By COLONEL TROLLOPE (late Grenadier Guards)

La Conquête de l'Air (current numbers).

By MAJOR B. BADEN-POWELL (late Scots Guards)

A complete set of the "Proceedings" of the Society.

By MR. H. CHATLEY, B.Sc.

"The Force of the Wind."

By MR. P. Y. ALEXANDER

"Alexander's Aëronautics."

"The Screw Propeller," etc., by A. E. Seaton.

By MR. B. J. P. ROBERTS

A set of three micromanometers.

By MR. P. Y. ALEXANDER

A Barograph, complete.

2. The undermentioned models and books have recently been purchased and can be seen at the Society's office. The models, together with lantern slides, are available for issue on loan to members for lecture purposes.

MODELS

The Bros. Wright Flying Machine, with rail and pilon.

The Farman Flying Machine.

The Blériot Flying Machine.

The Clarke Models (2).

The Burge-Webb Models (2).

BOOKS

"Mathematical Magic," by J. Wilkins, Bishop of Chester. 1691.

"Les Ballons," by Julien Turgan. 1851.

"Description des experiences de la Machine Aérostatique de MM. de Montgolfier," by F. de Saint Fond. 1784. 2 vols.

"Aërial Navigation," by C. B. Mansfield. 1877.

"Aëronautics; an Abridgement of Aëronautical Specifications, 1815-1891," by G. Brewer and P. Y. Alexander. 1893.

"A System of Aëronautics," by John Wise. 1850.

GENERAL MEETING.

The second meeting of the 44th session of the Aëronautical Society of Great Britain was held at the Institution of Civil Engineers, Great George Street, S.W., on Monday, May 3rd, 1909, to present the gold medal of the Society to Messrs. Wilbur and Orville Wright.

The President of the Society, E. P. Frost, Esq., J.P., occupied the chair, and was supported by Lord Montagu, Sir Hiram Maxim, Major Baden-Powell, Colonel Capper, Colonel Trollope, Lieut.-Colonel Templer, Dr. Shaw, J. C. Inglis, Esq. (President of the Civil Engineers), E. S. Bruce, Esq., Colonel J. D. Fullerton (Hon. Secretary), and others.

The PRESIDENT said: My Lord, Ladies and Gentlemen,—It really requires no words from me to introduce to you our distinguished visitors. The Wright Brothers are known all over the world, and their fame will pass down to posterity. They are, indeed, the embodiment of courage, of perseverance, and ingenuity. (Applause.) We are here this evening to extend to them, our renowned visitors, a most hearty welcome to this country—(applause)—and especi-

ally to this beautiful hall this evening to ask their acceptance of the gold medal of the Aëronautical Society of Great Britain. (Applause.) I am going to detain you with but very few words, for I know that there are others who are waiting anxiously to express in one way or another their satisfaction and their welcome to our distinguished visitors, so I will call upon Major Baden-Powell to say a few words. (Applause.)

Major BADEN-POWELL: My Lord, Ladies and Gentlemen,—This is, indeed, a red letter day in the annals of the Aëronautical Society. Many years ago it was decided to present a gold medal to whoever were considered to be really worthy of it, and I feel sure that all here present and all members of the Society will agree that we could not do better than to present it to our visitors of to-night. (Applause.) Not only are they the pioneers of flight, but they are also scientific investigators who have devised every detail of that wonderful contrivance by which they have accomplished this flight. (Shouts of "Bravo!" and applause.) The name of the Brothers Wright is known throughout the world. We all know their story, but it is a story that is well worth repeating, if only as an encouragement to those hard workers who are at the present moment unnoticed and unknown, and yet who, in their time, may come forward to emulate our visitors of to-night. (Applause.) We know how some eight or ten years ago the Messrs. Wright started their experiments in flight. We know how they toiled away in privacy, away in the wilds of the Kill Devil Hills in America. We know how they made, first of all, gliders to glide down the sides of the hill, how they progressed away working hard at this, unknown and unheard of, and even unbelieved. We know that gradually they improved in their designs, and eventually they got on to proper flight. It was in the year 1901, when they were busy with their investigations, that Mr. Wilbur Wright sent a communication to the Journal of the Society—a most interesting article it was—and we can only hope that he also gathered some ideas from the reading of other papers in the Journal. We can well imagine how they plodded along, meeting with sometimes success and sometimes failure. I so well know the kind of thing myself, having made such experiments in the wilds of the country, and I can well appreciate how sometimes they had successes which encouraged them to go on, and at other times repeated failures again and again which might have discouraged less energetic men. But eventually they succeeded, and finally, after having made all these tests with their gliders, after three years of preliminary work, they got to that stage when they could apply the motor to their gliders and were able to start off with a real flying machine. That was nearly five-and-a-half years ago, in 1903, that they accomplished their first flight. These were still conducted, as we know, in private; even the ubiquitous newspaper men were incredulous of the marvellous stories they heard of their flights, and paid no attention to them. Only after two years of experimenting did they have to relinquish their trials, when the truth began at last to leak out and they found that privacy was denied them. But they had achieved their ambition—they were the first men to fly. (Applause.) That must have been, indeed, a proud moment when they could say they were the first men to fly. And the reason why I am addressing you to-night is that that pride—a sort of reflection of it in a small way—has devolved upon myself because I feel some pride in saying that through the great kindness of Mr. Wilbur Wright I have been enabled to sit beside him and to travel some miles in the air in his company. (Applause.) And I am sure that not only now, but in the future, I can look back on that time with the greatest pride, when I remember that we were among the first score or so of human beings to travel the air in a flying machine. It must be realised that these things are not to be achieved in a day. Very often sanguine inventors will tell us that they are about to accomplish this, that, or the other, that in a few weeks or a few months they will be able to achieve these great things, but we know that in order to make a real practical machine many years may be spent in making up all the parts that go towards it, and in considering the details and in studying every effect. After all these years of study—and these men, by the way, have always worked together, not allowing

kudos to remain with one or the other, but they work hand in hand—(applause)—they finally decided to give their invention to the world, and both in America and in Europe they exhibited the wonders of their device and called upon them the plaudits of the world. They emerged from their sequestration in triumph, their names have been heralded to the whole world, and they have been numbered amongst the great inventors of the age. They have been welcomed by Kings, Princes, and Cabinet Ministers, as well as by the peasants. And we all, every lover of progress, every admirer of persistent energy, we all accord them our heartfelt wishes for prosperity and success, and we shall look forward to the day when they will give us a demonstration of this marvellous machine in England. (Loud and continued applause.)

Colonel CAPPER: My Lord, Ladies and Gentlemen,—I am no orator as Major Baden-Powell is, but it is with feelings of great gratification and pleasure that I was asked to say a few words on this occasion, because I hope that I may be considered by the Wright Brothers and Miss Wright as among their friends. I had the great privilege and pleasure of seeing them at their own home some years ago, and I have the most grateful and pleasant recollections of a day that Mrs. Capper and I spent at Dayton. They were hospitality itself and kindness itself, and made us feel at once that, though we were English, we were at home with them, Americans. (Applause.) I think that anyone who has had the privilege of knowing these gentlemen will agree with me in saying that they have something to be even more proud of than their great invention, and that is their simple-minded honesty and kindness, and the way they stick to their friends. (Applause.) Coming here among us, as everybody knows, world-renowned and so on, I was immensely struck when I saw them to-day—they were just as kind and unaffected and pleased as if they had been nobodies. (Laughter.) This is most delightful in these days, when all of us are apt to get puffed up heads if we do anything at all, to find people so utterly unaffected and unspoilt. (Applause.) I think that is a thing of which people may be more proud than of anything else almost. Their merits in flying have been mentioned, and no one need say a word more about them; they speak for themselves. As for the value of their invention in the future, words fail to say what may be the effect of flying on the future of our race, and of all races in the world both from the point of view of war and the point of view of peace—we cannot say, but the nation that gets behind will be very badly left. (Applause.) I hope that when they next pay us a visit they may find that we also in England, owing to the studies of this Society among others, may be able to show them something that will compete in friendly rivalry with theirs. (Applause.) But apart from all that, I wish you to give them a real true British welcome with three cheers at the end of it. I ask you now to give three cheers for the Wright Brothers, not forgetting Miss Wright.

Three hearty cheers were given, and an extra one for Miss Wright, and the whole gathering joined in an enthusiastic rendering of "For they are jolly good fellows."

Mr. ERIC S. BRUCE: Mr. President, Ladies and Gentlemen,--We are honoured to-night by the presence of two men who have first done what no one else has done. Their presence has an intense interest for us because they first did what we all for years and years have been trying to do. They have realised the dreams of fairyland, the aspirations of enthusiasts, the hopes of scientists, the desires of aeronauts. They have first flown. (Applause.) We are all here to-night to endeavour to honour them by the presentation of the highest award of the oldest Aëronautical Society in the world. (Applause.) The special glory of their achievement is that it is not the result of chance, it is not blind fortune, luck, or fate that brought them to their goal, but patient directed endeavour, years of scientific research, days of remorseless experiment—the exercise of these qualities has resulted in an individualism that has for ever silenced the prejudiced critic who has limited the possibilities of science and declared that human flight was impossible. (Applause.) It is with no little personal pleasure that I make these few remarks on the work of these two great men, for during those pleasant

Presentation of the Aëronautical Society's Gold Medal to Messrs. Wright

E. S. Bruce Dr. Shaw Col. Trollope E. P. Frost, D.L. (*President*) J. C. Inglis Sir Hiram Maxim

Lt.-Col. Templer Wilbur Wright Orville Wright Major Baden-Powell

eight years I was Honorary Secretary of this Society it was at times my great privilege to have correspondence with them and to publish in the "Aëronautical Journal" the communications of their progress. We all know how they prefaced their experiments with gliders, with exhaustive laboratory researches, and how their experiments with motor-driven aëroplanes were preceded by quantitative experiments with gliders, depending only on gravity for their motive power. We know, too, how, when they first applied motive power to their machines, they made only short flights of seconds' duration, gradually increasing them till they were able, in November, 1905, to communicate to us the welcome news that they had flown in America for 24¼ miles in 30 minutes 3 seconds. We know, too, how recently in France and America Mr. Wilbur Wright and Mr. Orville Wright have respectively increased their records, until Mr. Wilbur Wright, at Le Mans, on the last day of the last year crowned his previous efforts with the proud record of over 77 miles in 2 hours 18 minutes 33 seconds. (Applause.) But besides inborn genius and scientific method, the characters of these men embody other attributes which have done much to win the esteem of men and nations; I refer to that modesty and absence of self-seeking which has marked their progress in the solution of one of the most difficult problems man has ever faced. I think we must all to-night feel most thankful that Mr. Orville Wright, who experienced last summer so terrible an accident, has been mercifully spared to be with us this evening. (Applause.) I was myself present at Mr. Wilbur Wright's experimental ground at Le Mans when the sad news of the accident came and shared in the grief and sympathy which spread through the vast assemblage. We all, I am sure, offer Mr. Orville Wright our heartiest congratulations on his recovery. (Applause.) But it is not only the Aëronautical Society of Great Britain that rejoices in the visit of the Brothers Wright. Great Britain herself welcomes them to her shores; Great Britain, that, from where'er they come, ever welcomes the messengers of knowledge, truth, and progress. (Applause.)

The PRESIDENT rose in his chair and, turning to Mr. Wilbur Wright, who sat on his right hand, said: And now I have the honour, the pleasure, and the privilege on behalf of the Aëronautical Society of Great Britain to present to you, sir, and to your brother, Mr. Orville Wright, the gold medal of the oldest Aëronautical Society in the world.

The President presented the gold medal to Mr. Wilbur Wright amid tremendous applause.

Mr. WILBUR WRIGHT, who, on rising, was received with loud and prolonged cheers, said: Mr. President, Ladies and Gentlemen,—It is with a feeling of peculiar pleasure that my brother and I find ourselves able to be the guests of your Society to-night—a Society which we have known by reputation and by name to a great extent—by the names of its individual members—ever since we have been studying the problem of flying.

More than fifty years ago, at a time when flying was little thought of in the world, some of the citizens of England banded themselves together to form this Society, and through all the years which have followed, during times when any talk about flying was considered ridiculous and all the people who thought anything about it were laughed at, this Society met every year to consider the subject of flying, to report on the work which its individual members had been doing, to publish the papers which were read, and to spread them through the world for the benefit of others. And after nearly fifty years we at last find men flying. For this reason, and during all these years until a very recent period until after men had begun to fly, the Aëronautical Society of Great Britain was the only Society in the world, so far as I know, devoted to the subject of flying as distinguished from ballooning. So it is with a feeling of especial pride that my brother and I have received this medal this evening, and we thank you—we thank you for your kindness most especially.

Mr. ORVILLE WRIGHT rose amid great cheering and said: Mr. President, Ladies and Gentlemen,—I will not attempt a flight of oratory. I only wish to express my thanks for the very cordial reception the English people have given us and the way this Society has honoured us this evening. (Great applause.)

The meeting then concluded.

SPECIAL GENERAL MEETING

A Special General Meeting of the Society was held on June 9, 1909, with reference to which Circular Memorandum No. XI. was issued to members. The matter therein referred to is still under consideration. The result will be communicated to members in due course.

GENERAL MEETING

The Third Meeting of the 44th Session of the Aëronautical Society of Great Britain was held at the International Travel, Sports and Pastimes Exhibition, Olympia, on Wednesday, July 14, 1909. The President, Mr. E. P. Frost, J.P., occupied the chair, and there was a good attendance of members.

The PRESIDENT: Ladies and Gentlemen, we meet here to-night under peculiarly advantageous circumstances, as we shall not only hear some good papers, but we shall also have an opportunity of inspecting the very remarkable and interesting collection of exhibits shown by the Society at its Stand No. 64, in the Main Hall of the building.

I do not propose to detain you much longer, but before I call upon Colonel Capper to read his paper, I may, I think, allude to the patriotic efforts of the *Morning Post* to bring home to the inhabitants of this country the work being done by foreigners in Aëronautical Science, and also to the praiseworthy efforts of the Women's Aërial League to interest their countrywomen in the same subject. Both these movements have our heartiest good wishes, and we trust that they will receive that support which it is so desirable should be given to them.

I will now call on Colonel Capper to read his paper.

The Practical Application of Aeronautics

By COLONEL J. E. CAPPER, C.B., R.E.

Now that the science of aëronautics is making such strides in advance, it is well worth while to consider what are the practical ends we have in view.

The work of both experimenters and inventors should be conducted with a clear idea of what is the ultimate object to be attained.

The obvious general answer may, of course, be given that what we are striving for is "the conquest of the air." But this is far too vague, and we have to define more clearly in what the conquest of the air consists.

A real conquest of the air would necessitate man's power to move at will through the air from point to point of the earth's surface with the same certainty of arrival up to time as is now expected of first-class steamship lines or railways, no matter what the weather may be, but this is far from being within the bounds of practical politics at present, and we must be content at first to arrive at a point at which our implements may prove of some practical utility, making progress as we gain experience.

In order to obtain some knowledge as to what must be the capabilities of practical machines, we must know the purposes for which they are intended.

Machines may be used for:—

Sport,
War,
Exploration,
Commerce, including postal services,
Regular long or short distance transport.

I place sport first, not because it is the more important, but because machines of comparatively feeble power may be usefully employed for sporting purposes, and it is by encouraging these that progress may eventually be made till practical value can be obtained from them for other purposes.

And now it is necessary to divide flying bodies into two divisions, viz., those "lighter than air," in which we may class all machines the whole or part of whose weight is supported by a gas bag, and "flying machines" proper, which are not dependent on any gas bag for support.

The necessity for discussing each kind separately is due to the fact that each has advantages which render it more suitable for special purposes than the other, and they cannot be classed exactly together.

We will deal first with the dirigible balloons. I want to correct a popular fallacy as regards the nomenclature of dirigible balloons. These are conveniently and correctly divided into rigid, semi-rigid, and non-rigid structures.

The *rigid* structures are those in which a rigid framework surrounds the lifting balloon or balloons of which there may be many, the car or cars being built on to or into the same framework.

The *semi-rigid* are those in which there is an exposed envelope to which a rigid framework is closely attached. To this the car may be attached, or from it the car may be suspended.

The *non-rigid* are those in which there is an exposed envelope to which there is no rigid structure attached (with the exception perhaps of horizontal and vertical stability planes and rudders), but from which the cars are suspended by ropes.

Now all these systems may be rigid, *i.e.*, may form a structure, no part of which can move without the rest moving with it, and each portion of which is rigid, *i.e.*, will retain its external shape when subjected to outside pressure.

In the *rigid* balloons the external shape is kept rigid by the framework over which a cover is tightly stretched, the internal balloons may be quite flabby.

In the *semi-rigid* and *non-rigid* types the external shape of the envelope is kept rigid by the internal pressure of the gas, whilst the suspension is so arranged as to make the whole system rigid.

This is a matter of the greatest practical importance and should be clearly understood.

In a well designed envelope the head resistance of the air may possibly be kept as low as $\frac{1}{16}$th part of the resistance on a plane of the same sectional area.

Assuming that we can keep our balloon to an internal pressure of 1 oz. per square inch, we get an internal pressure of 144 ozs., or 9 lbs. per square foot, and if our head resistance is kept down by suitable construction, the balloon will remain rigid even when going at very high speed.

For sporting purposes the dirigible balloon appears to be of little value. Its cost is great, it is expensive to house and is easily damaged, so that it could only be the amusement of very wealthy people.

For minor purposes of war (such as short reconnaissances on land), any dirigible balloon must have the following qualities:—

It must have power to lift a crew of three men with an observer, a wireless telegraph operator and equipment, to a height where it may be tolerably safe from artillery fire (say, 6,000 ft.), and must be able to move at that height for at least 3 hours at a speed which will enable it to fight against the average winds to be met with. This speed is a matter of differences of opinion, but I think the lowest speed should be 30 miles an hour in a calm.

It must, of course, be controllable in both a vertical and horizontal direction; it should be fairly immune from injury by storms when on the ground, and should be capable of being taken to pieces and easily transported if the necessity should arrive of deflating it.

Dirigible balloons, practically fulfilling these conditions, have already been constructed, but there is still a vast amount of work to be done by the inventor and experimenter in order to perfect the instrument.

Improved engines, requiring less fuel for a given power, stronger and lighter envelopes, with better capacities for holding hydrogen, the conservation of the products of exhaust, means for preventing changes of altitude owing to alteration of temperature, structural improvements in the framework, all offer fields for those with inventive minds, while much is yet to be learnt by the experimenter both in the laboratory and in the ship itself as to shapes of all parts of the structure, sizes, shapes and positions of control and stability planes, the best materials for all parts, and the best propellers.

One man can hardly devote proper attention to all these points at once, though one man who has the necessary data at his disposal may well combine the work of many others into something resembling a practical whole. I would, therefore, strongly advise inventors especially to choose their special lines and not attempt to design a perfect machine.

In Naval reconnaissance other qualities are required. It will not be necessary for machines to rise to any great height, for at sea a dirigible balloon would take care to keep clear of the enemy's guns, but it must be capable of going at great speed, must be able to cover great distances, and return to safe harbour in its own protected seas or on shore.

Such a machine will pre-eminently require to have excellent gas-holding qualities, to be secured against temperature changes, and to have the power of anchoring, either by casting out floating anchors on the sea, or to fixed points raised high above surrounding ground.

It must look after itself and can hardly hope to obtain new supplies of hydrogen until it returns to its proper home, and may have to ride out severe storms at sea, or to descend in calm water on to the sea itself. Therefore, the rigid type would appear most suitable.

Vessels of the largest capacity will probably have to be used, and the design of the structure calls for the highest engineering skill and knowledge of materials to combine rigidity with lightness.

There is plenty of room for experimental work in connection with dirigibles of this nature.

For exploration, vessels may be of two types, large ones as for Naval reconnaissance, but with the power of rising to great heights to avoid mountains or high tablelands, and smaller ones which would only make comparatively short journeys from bases at the coast or from shelters erected inland.

These vessels must of all others be perfect gas holders, and have a very ample margin of lifting power to enable them to overcome temporary rain or snow storms; their fuel supply must be large, and to be really practical, they should be able to pick up ballast from the air to compensate for drying after heavy rain.

There is ample scope for discovery which will especially assist these balloons in obtaining ballast which will quickly pick up oxygen or nitrogen in large quantities on exposure to the air, and for invention in making a light hydrogen plant, which will enable hydrogen to be manufactured on board from materials carried.

Safe, certain and practical methods of heating or cooling the gas at will would also be of the greatest assistance, but will probably only be applicable to the largest vessels.

For commercial purposes it is conceivable that the dirigible balloon may be used for every light and valuable cargoes, but only in very exceptional cases, the cost and risks of transit would be very great, whilst, unless the speed developed is very high indeed, there can be no certainty of their usefulness to the postal service, or for the regular transit of passengers, except in a country where railway facilities are wanting, where road transit is slow and difficult, and where an irregular service of dirigibles would be the only practical means of speedy locomotion. In such services, however, it is above all necessary that there should be the best of terminal stations with sheds, hydrogen plant, fuel, and personnel, and the dirigible balloon must be very highly developed in all respects before it can be held to have any practical value in this direction.

As regards "flying machines":—

For the immediate future the use of the flying machine would appear to be confined to the rôle of sport.

For sporting purposes any machine capable of rising from the ground, of sustaining itself in the air for distances of from a mile upwards, of turning in the air and of alighting safely on open ground of limited size, may be considered suitable.

It need not rise high, it need not necessarily be capable of combatting high winds or of remaining in the open in all weathers, nor need it be of a type that is easily managed in the air, as sporting contests may be of very short duration, so that the aëronaut may undergo a physical and mental strain in keeping his balance such as he could not sustain for long.

For war purposes, however, a flying machine must be far different. First and foremost it must be reliable, capable of going up and staying up for some hours in almost any weather, of steering in any direction and of keeping its balance without much effort on the part of its pilot. It must be able to rise speedily to a height of at least 3,000 feet, where the occupants will be reasonably secure from

infantry fire, to carry to that height at least one observer besides the pilot, and be able to return speedily and land safely on ordinary open ground without damage.

Progress will have to be very great before any flying machine may be considered practical for such purposes.

Flight can be attained by machines of very different builds, and heavy weights can be lifted, but it is doubtful how far any of present design can be considered stable in any but light winds, and none have shown capacity to rise to great heights, nor have any of the light engines now used apparently proved absolutely reliable.

Automatic stability may depend on design of wing surface, on niceties of curvature or on mechanical appliances. In war machines it appears particularly undesirable to trust totally to the skill of the pilot, who may be injured by a stray bullet and whose incapacity might lead not only to the loss of the machine and its occupants, but to the far more important loss of invaluable information with them.

Practical experiments should accordingly be largely devoted to increasing the automatic stability of machines and to securing reliability in the engine power, rather than to the evolution of speedy but unreliable machines with which flights can only be made in certain states of the atmosphere, and which will rise one day and fail to rise the next.

That failures will occur with even the best machines may be expected, but great waste of money, time and effort is certain to occur whilst every inventor has his own design, often based on no sound principles, and makers of light engines devote themselves to producing engines which will give out a high horse-power per unit of weight for a few minutes, but speedily drop in efficiency to far below the maximum effort, and not infrequently cease to act altogether.

There is ample work for the laboratory experimenter still in study of resistances, position and shapes of propellers, lift and drift of surfaces, and much can be learned from models, whilst the aid of mathematicians and the engineer will often enable incorrect designs to be altered for the better, or to be discarded as hopeless failures before construction is begun, but the construction of flying machines of the aëroplane type is so comparatively inexpensive that given close study of the subject and a thorough knowledge of the general principles of support by and stability in the air, it is not improbable that improved types of existing patterns with powerful and reliable engines may speedily put us in possession of suitable machines for reconnaissance in war.

Exploration machines require the same properties as war machines, reliability, stability and power to lift an observer being the chief. They should also be able to rise without assistance from even rough and enclosed ground, since, in order to explore thoroughly, landings will have to be made in possibly rough and desolate country. Types that might be suitable for war, where starting and landing places may speedily be prepared, might prove unsuitable for any but casual exploration in most countries. A higher type of machine is therefore required.

Absence of power to carry weight will probably render flying machines commercially unimportant, though reliable machines may not improbably be utilized for postal services in uncivilized or semi-civilized countries.

It appears quite improbable that for many years they can be utilized for regular travel of large numbers of passengers, and it is quite premature to attempt to design vessels for such a purpose.

For the rapid transit of individuals in daily life a machine must be small and handy, capable of folding on itself so as to take up little space, and of travelling by its own power or ordinary roads, otherwise some other form of transit would be required between the flying machine stations and dwellings or places of business, and it would be long before houses were ordinarily adapted to be entered and departed on from the roof.

For those who are exhausting their brains in an effort to design such a machine, I would say, first make sure your machine can fly and do all that is asked of it in the air, and then consider how you can adapt it for purposes for which the motor car is now used.

If I am correct in my opinions the market before the constructor of the diri-

gible balloon or flying machine builder is not at present a large one.

Few but Governments will use dirigible balloons, though some may occasionally be used for sport or for special occasions of amusement.

They cannot enter into the ordinary life of the people until perfected far beyond their present stage, as travel by them is too uncertain and surrounded by unknown risks and dangers. In time, as in the case of railways and steamships, these difficulties will be overcome.

For those who, nevertheless, study their design I would like to give a few practical hints, foremost of which is to read of what has been and is being done by others, to study the theory of balloons and not imagine that every hazy idea in their brain is worth a fortune.

Next, having settled on the rough general design and the speed you hope to attain, work out in detail the practical arrangement of each individual part, make up your mind what engine power you want, and what engines you propose to use, ascertain their real weight, work out the details, strength and weights for your propellers and all the driving gear, ascertain the weight of fuel required, of water and radiators, allow for the crew and a large proportion of ballast, then calculate the strength of all members of your car, work out its weight, then the same with the suspension arrangements if any, ascertain what fabric your balloon is to be made of, calculate its strength and weight, and size and weights of controlling planes, etc. Take all your total of weights, add $\frac{1}{4}$ of it for the ballonnet capacity etc., and see what total weight you have now and how much hydrogen you require to lift it. Then see if your balloon is big enough or too big, and you will probably find most of your work has to be done over again. When all is suitably fitted in, go through it all again four or five times to make sure all is right, and then get a practical friend to look over your design and calculations and see if you have evolved anything that on paper looks a great advance on what already exists. If not, be sure that your work is of little practical value, and try something else for a living.

There is an old saying that "any fool can build a house." The same might be said of a dirigible balloon. As one who has practically tried to do both, I may tell you from bitter experience that it is only when one really sets about the job that one finds how little one knows in reality, how much has to be learnt from the work of others, and how far the finished article falls below the summit of possible achievement.

At the risk of boring you all I cannot conclude without a word as to the very practical bearing of meteorology on aëronautics. The meteorologist is to the aëronaut as the hydrographer is to the ocean navigator, only he is far more important. Currents in the ocean are slow and moderately certain, those in the air are swift and constantly changing. They are but little understood by even those who have devoted their lives to the study, and the equipment for arriving at an understanding of them is exceedingly scanty. Aërial navigation can never be carried on satisfactorily until they are better understood, and I would ask those of you who have special facilities of locality, leisure, and the necessary funds, to aid in any way you can by taking even occasional observations in the air, by means of kites.

Although high kite flying necessitates somewhat expensive winding gear, very useful observations can be made by recording instruments at a height of even 1,000 feet, which can be reached by a kite manœuvred from a small hand winch.

Dines' meteorographs are not expensive and a suitable kite, a winch, and piano wire can be obtained at a comparatively small outlay, whilst the result of numerous observations, taken at different stations, when worked out by the Meteorological Department would aid greatly in arriving at the solution of some of the most important problems affecting our atmospheric disturbances.

The PRESIDENT: I am sure this interesting paper deserves discussion. I hope that some of the members will give us their opinion on the points raised by the author.

(No response)

The PRESIDENT: I regret that there are

no critics ready to discuss this subject, as many of the questions raised are of considerable interest. It is, of course, somewhat difficult to comment upon them at such short notice, but I hope that members will forward their written opinions regarding them, for insertion in the Journal of the Society later on.

The next paper is by Mr. Nyborg, who is, I regret to say, unable to be present this evening, but the Hon. Secretary will read a brief abstract of its general purport.

Colonel FULLERTON, R.E. (Hon Secretary): Mr. Nyborg's paper, "A Criticism of the Present Status of Dynamic Flight," is an interesting one, but it is, perhaps, more suitable for reading in the study than at a meeting of this description. The Council has therefore decided to publish it in the *Journal* as soon as some further information regarding his system of calculating air pressures is received, and members will then be able to study the ideas suggested at their leisure.

Briefly, Mr. Nyborg's main contentions are that the present types of machine are much too heavy, and that they require a great deal too much power for the work they do. He points out that what is wanted is improved designs, which, by reducing the resistance to forward motion, economise in power, and thus enable flight to be carried out under much more favourable conditions.

The PRESIDENT: I will now call upon Mr. Thurston to give us a description of his invention for automatically controlling the speed of flying machines.

Mr. A. P. Thurston read his paper.

[This paper, with the discussion upon it, will be published in the next number of the *Journal*, as Mr. Thurston desires to have a little time to consider the points raised by the speakers.]

The PRESIDENT: We all know the desirability of having some system of regulating machines, and we are much obliged to Mr. Thurston for bringing the subject to our notice.

As, when we are at Olympia, our time is not exactly our own, I will now bring the meeting to a close.

On the motion of Colonel Fullerton, R.E., seconded by Colonel Capper, R.E., a hearty vote of thanks was accorded to the President for presiding at the Meeting.

The Early Experiments of Otto and Gustav Lilienthal

By GUSTAV LILIENTHAL

Having been the companion of my brother from the beginning to the bitter end, it can be understood that after the shock I got through the accident I did not continue the experiments for a long while, although I studied theoretically a good deal ever since. My attention was mostly directed to the object of how to get a greater stability for flying machines.

It is a great mistake of the public to think that the apparatus by which the accident occurred was a flying machine. It was only intended to demonstrate in a larger scale the sustaining force of the wind, which we had measured in the different angles and velocities.

These measurements we began systematically in 1871 after my brother's return from the Franco-German War.

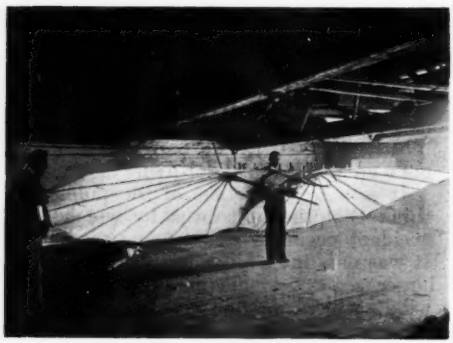
We had been building flying machines from our boyhood, and spent our holidays mostly by sewing goose feathers to canvas, mounting them on willowrods, and joining these together so as to form large wings, with which we ran down-hill to try to jump into the air, but with very little results.

We found even at that early period that flying wants moving air. In fact, there are only a few smaller birds able to rise vertically in still air, the larger birds want forward motion whilst rising on a breeze like the Albatross finds on the sea, which lifts him when the bird stretches his long, narrow wings. When on a voyage to Australia, all my letters to my brother contained descriptions of this royal soarer. After my return from Melbourne, where I had been as assistant engineer on the Government Railways, I brought the body of an Albatross with me, which now hangs stuffed in my lobby. I could not tell my brother often enough how wonderfully this bird soars without moving its wings.

This was 1886, and we recommenced these experiments, trying to find the most

favourable section of planes. We built an apparatus with two long arms fixed to an axle and revolved by a cord and weights. This apparatus you find described on page 61 in "Der Vogelflug" (Berlin, Weidmannsche Bockhandlung, 1889).

By this we could measure the horizontal and vertical resistance of the air. We found that the slightly curved surface is the most favourable form. These results showed such a difference to those with planes that we thought we made mistakes or the apparatus did not act correctly, although we tried it over and over again. These experiments were made at first in a large hall of a public school, and afterwards on quite calm mornings in the garden of my brother's house at Gr. Lichterfelde. The result was always the same. For instance, when we had fixed to the ends of the rotating arms a plane raised to an angle of 15° with the horizon, the vertical pressure we found to be .31 of the normal pressure, that is, the pressure which the same plane received when moved horizontally, but placed vertically.



Lilienthal's Gliding Machine

When the same driving power was used with a curved surface, having a rise of 1/12 to the cord, also in an angle of 15°, the vertical pressure rose from .31 to .69 of the "normal pressure," being more than double of that received with the plane.

This result gave us a hint of the secret of the soaring bird, as all birds' wings show us a curved surface of nearly the same form which we found to be most favourable.

We then tried to find the pressure of the moving air on fixed surfaces. So we attached our surfaces to a lever which was counterbalanced so as to be in an indifferent equilibrium. The pressure of the air was measured by specially-made spring balances, and the velocity of the wind was noted at the same moment when the pressure was measured. The experiments were continued nearly two years in different fields in the neighbourhood of Gr. Lichterfelde. They gave us great surprise, for the vertical pressure rose again. Considering the same example as before, we found that at 15° the vertical pressure rose from .69 to .92 of the "normal pressure."

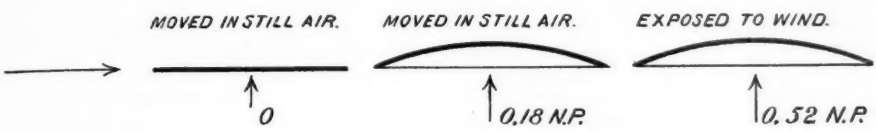
Still more paradoxical seems to be the result of the measurement, if the comparison is drawn between a plane placed horizontally to the motion of the air.

The plane on the rotary apparatus in still air received no vertical pressure at all. Nobody would expect otherwise.

Lilienthal's Bi-Plane Glider starting from the artificial hill at Lichterfelde

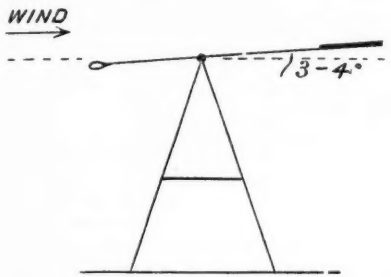
The curved surface placed in the same position received a vertical pressure of .18 of the normal pressure, but when attached to the apparatus and exposed to the wind of the same velocity as tried on the rotary apparatus, the vertical pressure rose to .52 of the normal pressure.

Please compare these sketches—



As we tried in the wind also the curved surface with the hollow side upwards we found that the pressure was not the same downwards as it had been upwards, when the angle of incidence was otherwise the same.

Then we exposed a plane well counterbalanced to the wind, and found that this plane always was lifted about 3-4° above the horizon.



Even when the wind was blowing with the downward slope of the field, still the plane showed a slight upward direction. This brought us to try a set of five planes attached to a high pole in distances of two metres apart, the highest being 10 metres above the ground.

All these planes showed an upward direction only, dipping occasionally under the horizontal line for a few moments, but sometimes lifting even 8-10 degrees; the average we found to be about 3.5 degrees over the horizontal.

This explains that the vertical pressure measured in the wind must be larger than measured when the planes move in still air. Here, again, we got nearer to the wondrous soaring of the birds.

I am quite certain that the birds' wings are still more favourable than our experimenting planes, and that the pressure which the wing receives by the wind will not only be vertical, but that a small component of it will be even in a forward driving direction. To find this out would be my highest aim. To follow the lines which we have laid out and published in "Der Vogelflug" will bring us further than to connect a fifty-horse power motor to curved surfaces and drive it against the air by most uneconomically working propellers only as long as the benzine lasts.

I am sorry that my daily occupation leaves me only a little time to continue a work that has been so successful.

The Work and Experiments of Percy S. Pilcher

By ELLA TIDSWELL

At the request of the editor of the *Aëronautical Journal*, I am writing this short account of my brother, Percy Pilcher's work in aëronautical research and experiments, but before doing so I must plead in apology that I write entirely from memory, as I have no notes by me of any kind to which I can refer.

From Pilcher's earliest boyhood he was entirely wrapt up in the idea of flying, and from the time he was 13, when he joined the "Britannia," he made small experiments. I remember when he was 15, a cadet in the Royal Navy, his explaining to me what he believed would be the shape and working of the flying machine of the near future.

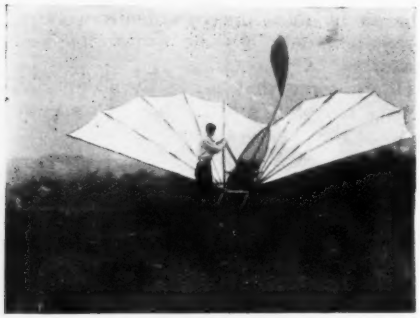
At 19 he left the Navy, worked through Elder's Shipbuilding Yard at Govan, Glasgow, and afterwards went to the University of London. In 1893, when he was Assistant Lecturer in Naval Architecture and Marine Engineering at the University of Glasgow, he began his experiments in aëronautics.

During the winter of 1892-1893 he built the machine we called the "Bat." The body-piece was, as far as I can remember, 11 ft. 8 ins. long and 2 ft. 4 ins. wide.

The area of the wings was ½ sq. ft. to the pound weight, the machine being constructed to bear, including its own

weight, from 180 to 200 lbs. The machine itself weighed 45 lbs.

The wings were laced to two rather heavy spars crossing a triangle in front of the machine, and guyed by wires to the triangle which reached 2 ft. 6 ins. below the body-piece and about the same distance above it. When the lacing to the front spars was undone, the wings folded back like a fan.



The "Bat"

It was necessary to have it so, in order that it would pack easily, as Pilcher was obliged to live in the town on account of his work. In Glasgow he had the loan of a large room under the roof as a workshop, while we had to go down to the country for the experiments.

In his first experiments the wings of the "Bat" were very much raised—almost V-shaped—and the rudder in this instance was shaped like the outspread tail of a crow, with a small vertical rudder to keep the machine head to wind, the horizontal rudder working up and down on the vertical one.

The very first day of the experiments, which were made in the beginning of '93, near Cardross, from a slight elevation and against a light wind, Pilcher was raised 12 feet from the ground, where he hovered without any forward movement for between 2 and 3 minutes, and then descended by tilting the machine forwards quite successfully. But the next time he rose the wind caught the machine sideways, and his weight being insufficient to restore the equilibrium it tipped forwards and sideways in landing, breaking one of the front spars.

After this he lowered the wing tips and had some very good results, such as from 30 to 40 yards about 10 to 15 feet from the ground, starting from the top of a hill and gliding against the wind, the angle, we reckoned, being approximately 1 in 10.

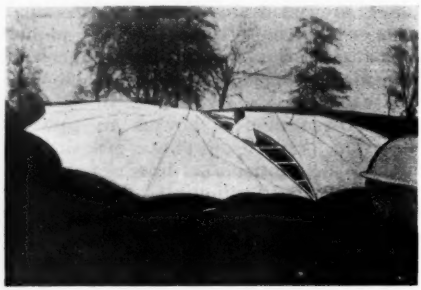
He also altered the rudder, which was now made of two round disc-sails, one vertical and the other horizontal, really formed of two large hoops covered with sail-silk, each of about 15 feet area, the vertical one being fixed, and the horizontal one working on it.

We took a farmhouse with a very large, empty barn at Cardross, on the Clyde, where we got a nice, clear wind on the hills, and he was able to practise almost daily, his longest soar with no motive power being about 60 yards, and greatest height about 20 feet.

It is very difficult to gauge the height accurately, as there must of necessity be no trees or anything near by which one might test it.

At Cardross he built two more machines. One was never quite finished as the framework, which was built to carry an engine, proved too heavy for soaring. It was a monoplane, the wings being very square cut, and the body-piece much the shape of the Blériot short-span flyer.

He then went rather to the other ex-

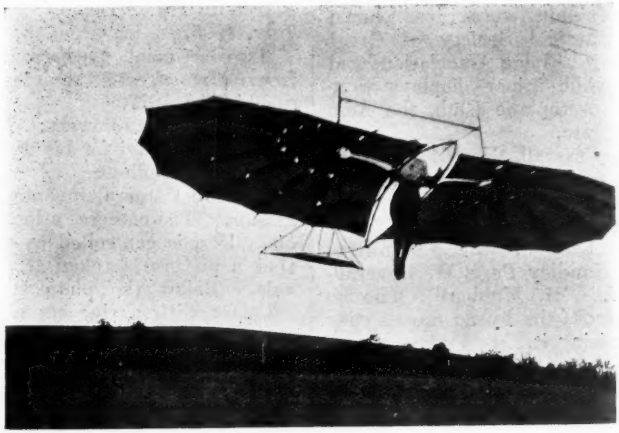


The "Gull"

treme, influenced, no doubt, by a month of very light winds, and the "Gull" was built with a wing area of 1½ feet to the pound weight, and was so light as to be cumbersome and impossible to use for practice, except with the very lightest breeze.

The "Hawk"—the most successful of all—was the last machine that Pilcher

built, and will be shown at the Travel Exhibition, Olympia. The "Hawk" was built at Eynsford, in Kent, with a wing area of $\frac{3}{4}$ foot to the pound weight, and was estimated to carry one man and an engine—about 250 lbs.



The "Hawk" in flight

The ribs of the wings are of pine wood, each rib slipping into a long pocket and the sail lacing on to the body-piece.

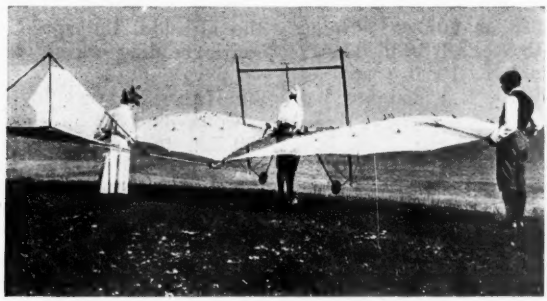
The curve of the wing is 1 in 20, and the apex of the curve about $\frac{1}{3}$ from the front of the wing.

The wings are guyed to two uprights, and the machine runs on very small bicycle wheels.

With this machine Pilcher had many very successful flights, notably one at Eynsford, from the top of one hill to the top of the next across a valley, when, as a substitute for motor power, he had a light rope attached to the machine, which was hauled in on a pulley on the far hill.

This flight was over 250 yards—nearly 300 yards—and, of course, in this case, across the valley, the flight was a high one. The balance was perfect, and so was the steering gear. The machine rose high, making a great upward curve from hill-top to hill-top, and landing beautifully.

Pilcher had hoped to add a motor engine to this machine the following winter. Drawings for it had been made, and the work of construction begun at his works—Wilson and Pilcher, Ltd., Westminster—when his career was cut short in his 33rd year by the fatal accident at Stamford Hall, Yelvertoft, caused by the snapping of one of the rudder guys during a flight, after a heavy rain, on September 30, 1899.



The "Hawk," rear view

Olympia

The Travel, Sports, and Pastimes Exhibition

This Exhibition was opened by Lieut. Shackleton, R.N., the South Pole explorer, on July 6, 1909. The principal aëronautical exhibits were those shown by the Aëronautical Society of Great Britain, the Kite Flying Association, and *Aeronautics*, while minor displays were made by the Aeroplane Club, the Aero Club League, etc.

The Society's stall, No. 64, was, as will be seen from the detained description given below, a very interesting one, and its arrangement reflects great credit on the members of the Committee (Messrs. F. Handley Page, G. Deverall-Saul, and T. O'B. Hubbard), who so kindly undertook the by no means easy task of organising it.

Aëronautical Society of Great Britain Stall No. 64

THE SOCIETY

A glider constructed by the late Herr Otto Lilienthal. The dimensions are as follows:—Span, 22 ft. 6 ins.; extreme width of main surface, 8 ft. 3 ins.; length of tail, 10 ft. 2 ins.; length of machine all over, 19 ft. 11 ins.; total surface, 160 sq. ft.; weight, 56 lbs.

A glider, named the "Hawk," constructed by the late Percy S. Pilcher, Esq. The dimensions are as follows:—Span, 24 ft. 8 ins.; length over all, 18 ft. 6 ins.; width of main surface, 10 ft.; area of main surface, 240 sq. ft.; distance between the tail and main surface, 5 ft. 6 ins.; area of horizontal tail, 5 sq. ft.; span and width of horizontal tail, 6 ft. 6 ins. and 2 ft. 10 ins., respectively; area and height of vertical tail, 2¼ sq. ft. and 2 ft. 10 ins. respectively; weight, 50 lbs.

Other exhibits of the Society included three models of the Voisin, Wright and Blériot machines; an experimental table; a collection of old prints, photographs, and posters; rare books from the Library; specimen silver and bronze medals of the Society, and the silver medal awarded to it at the Milan Exhibition, 1906.

E. P. FROST, ESQ., D.L. (President of the Society)

Wing propellers, working model fitted with 2-h.p. motor; weight, 120 lbs. This model was built some years ago by Mr. Frost and Dr. F. W. H. Hutchinson, who designed the gearing. A full account of experiments made with it appeared in the *Aëronautical Journal* for July, 1905.

Two artificial feathers, 15 ft. long, from Mr. Frost's steam-driven flying machine of 1877.

MAJOR B. BADEN-POWELL.

Original model for his flying machine, now at Dagenham.

Balloon Camera, invented by the exhibitor. The camera, a long film wound on rollers, is controlled by clockwork, so that a picture is taken at regular intervals. Below the plate is mounted a compass with a ring round it, the diameter of which ring is $\frac{1}{8}$th the focal length. A needle from an aneroid also projects so as to be shown on the plate. The camera is suspended below the balloon, pointing vertically downwards, and takes photographs of the country immediately below. After the voyage the film is developed, and a series of views obtained on each of which is marked: (1) the ring; (2) the compass needle; (3) the barometer needle. These are then compared with a large-scale ordnance map and the track of the balloon marked out.

By this instrument the exact course, the altitude, the speed, and the barometric reading are obtained.

SIR HIRAM MAXIM

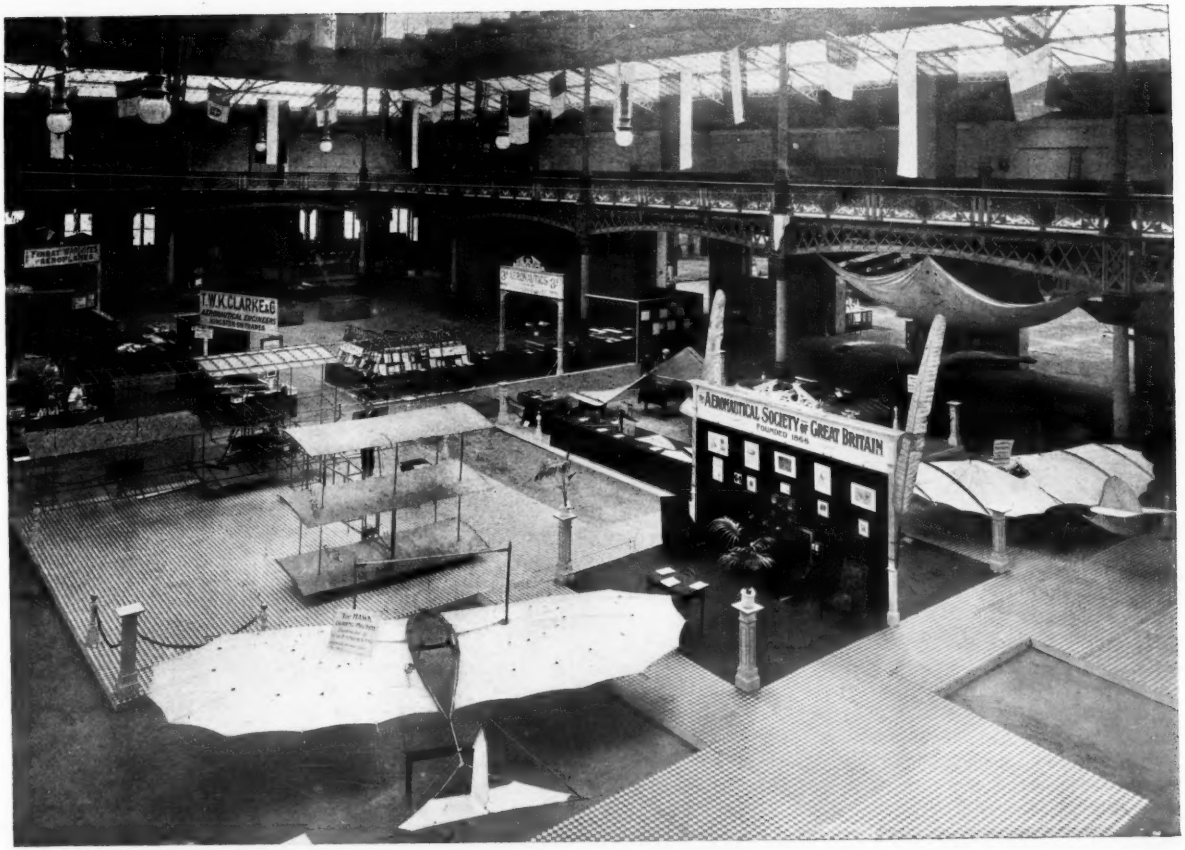
Compound Steam Engine using steam 300 lbs. to the square inch, developing 81-h.p. actual work on the screw itself. Weight, 320 lbs. This was one of the two engines built for his large flying machine of 1894.

One of the two screw-propellers used on the Maxim Flying Machine, 1894, Diameter, 17 ft. 11 ins.; width of blade, 5 ft.

Small experimental screws and photographs.

J. R. PORTER, ESQ.

Experimental Direct-Lift Flying Machine. The propellers in this machine



THE AËRONAUTICAL SOCIETY'S STAND AT THE TRAVEL EXHIBITION, OLYMPIA.

are designed to produce a horizontal and radial current of air. This centrifugal current is diverted into a downward direction by means of curved annular surfaces, with the result that an upward reaction is produced on these surfaces. The propellers are 5 ft. in diameter, actuated by means of a 6-h.p. motor provided with a clutch; the transmission is by belt over jockey pulleys. The machine has been built entirely for experimental work.

P. Y. Alexander, Esq.

Experimental Propellers used in the Henson-Stringfellow flying machine (model of 1842-7).

Starting-rail used by the Stringfellows in experiments with models. This was run along a fixed wire, at the end of which was an arrangement to release the flying machine.

Hull, Steam-Engine and Boiler (weight, 15 lbs.) of a flying machine constructed by F. Stringfellow about 1884-6. The boiler-copper consists of 16 inverted cones, each 7½ ins. long, 1¼ ins. diameter at the top, connected with water-tube at bottom; at the top is a superheating chamber 12 ins. long and 2½ ins. diameter. This boiler is the same design as that used by J. Stringfellow in his model aëroplane, which flew in 1848.

Two wings and tail made by F. Stringfellow, *circa* 1875, copied from the 1848 model.

A. V. Roe, Esq.

Full-sized Triplane. Dimensions: Total area, 620 sq. ft.; main surfaces, 32 ft. by 5 ft. 4 ins.; tail, 12 ft. by 4 ft. 6 ins.; length, fore and aft, 32 ft.; weight (including 35-h.p. motor), 650 lbs. This machine is exactly twice the size of that with which Mr. Roe has been making short flights on Leighton Marshes.

L. G. Davies, Esq.

Model Monoplane Glider. Span, 11 ft.; surface area, 24¾ sq. ft.; weight (without covering), 2 lb. 15 oz.

E. B. Mackenzie-Hughes, Esq.

Model device for maintaining stability: the swinging of the seat intended for the aëronaut operates small planes.

Miss M. Reavely

A small model after the pattern of the Wright machine, constructed by Master C. Besson, age 13.

A. P. Thurston, Esq.

Diagram of his invention for automatically controlling the speed of flying machines.

T. G. Nyborg, Esq.

Photographs of monoplanes constructed by the exhibitor.

NOTES

Early Gliding Experiments.*—Gio. Battista Danti, nicknamed Dedalus, was a man of great genius, and he alone in our times attained to that which was in vain attempted by the ancient Dedalus; for, one day, whilst many of the principal gentry had come to Perugia to honour the wedding of Gio. Paolo Baglioni, and some lancers were riding through the main street under his palace, he (G. B. Danti) unexpectedly, by means of a contrivance of wings which he had constructed of a size proportionate to his body, took off from the top of a tower near by, and with a horrible hissing sound flew successfully across the great Piazza, which was densely crowded; but (oh, horror, due to an unexpected accident!) he had scarcely flown 300 paces on his way to a certain point, when the main stay of the left wing gave way, and, being unable to support himself with the right alone, he fell on a roof . . . . . and was injured in consequence. Those who saw not only this flight, but also the wonderful construction of the framework of the wings, said, and tradition bears them out, that he several times took wing over the water of Lake Thrasimene to learn how he might gradually come to earth; but, notwithstanding his great genius, he never succeeded. He was also noted for other mechanical contrivances, whence he was held in great repute by the greatest Princes of Italy; and Gio. Paolo Baglioni took him as his engineer to Lombardy during the wars (with Venice in 1509), where he eventually fell ill and died.

"Antoinette IV."—The dimensions of the Antoinette monoplane, with which, at the time of writing, Mr. Hubert Latham intends to fly the Channel, are as follows:—Main sustainers, span 42 ft., area 324 sq. ft.; length, fore and aft, 39½ ft.; diam. of screw, 7.2 ft.; pitch of screw, 4.2 ft. It is driven by an 8-cylinder 50-h.p. Antoinette motor, the total weight—without the driver

* The above has been translated and kindly forwarded to us by Mr. J. C. Antinori. It is an extract from a book entitled "Perugia Augusta," by C. Crispolti, of Perugia, printed in 1648.

—being 570 lbs. For the purposes of the Channel flight the buffers in the centre of each wing—clearly shown in the striking photograph here reproduced—have been removed, and the supporting wheels beneath the chassis placed further apart.

On June 5 last, at Châlons, Mr. Latham broke the record for monoplane flights by remaining in the air for 1 hour 7 min. 37 sec.

As we go to press we learn that Mr. Latham started from Sangatte for Dover at 6.45 a.m. on July 19. When six miles out the motor stopped, and the machine glided down from a height of about 600 feet into the sea. Mr. Latham was rescued by the French torpedo-boat destroyer *Harpon*, and his monoplane towed into Calais by a tug. The machine was damaged during salvage, but the motor is intact.

[*By permission of the "Field."*

Antoinette IV., piloted by Mr. Latham.

The Experimental Ground

As a good deal of work has lately been carried out at the Society's Experimental Ground at Dagenham, the following brief account of it may be found of interest to readers of the *Journal*.

On the acre hired for building purposes, two sheds have been constructed, viz., a small one for the use of members, and a larger one capable of holding two fair-sized flying machines (at present occupied by the Baden-Powell and Saul machines). For Mr. Moreing's machine a special site on the E. bank of the lake, to the north of the Gulf Cottages, has been acquired, and his machine is now being put together in a large shed erected by him.

At the east end of the starting track, a shed has been erected for Mr. Neale's machine, and he is now carrying out the preliminary trials.

The starting track lies in the centre of the experimental ground, and is a hard made roadway, some quarter of a mile long, with an average width of about 36 ft. About 100 yards of it has been laid down with cinders, etc., and the remainder will be similarly finished as soon as the weather clears.

Minor work, such as clearing round the building site, a rough path from thence to the starting track, etc., has also been done.

As will be seen from the statement given below, every effort has been made to keep the cost of the work as low as possible, as the Council particularly desires to make the experimental ground a site where members can carry on their work and experiments with moderate expenditure.

STATEMENT OF ACCOUNT
TO 30th JUNE, 1909

	£	s.	d.		£	s.	d.
No. 1 Subscription List ...	248	18	6	Rent, including extra plot ...	62	0	0
No. 2 List (including £105 from the Mercers' Company, reserved for research work)	165	8	0	Legal expenses	6	16	0
				A Shed	60	19	0
				B Shed	55	0	0
				Miscellaneous expenses ...	4	7	6
				Balance (including Mercers' Grant)	225	4	0
	£414	6	6		£414	6	6

N.B.—C Shed and the starting track have not yet been paid for.

As regards the future, the Council considers that the following items are very desirable, and hopes that members will assist in carrying them out:

(A) General clearing of the ground; especially in the neighbourhood of the starting track, and building site.

A good deal of this work can be done by burning the rough bush, etc., when the weather gets drier, but a certain amount of actual clearing will also be necessary.

(B) Starting apparatus for full-sized machines. To be erected at the east end of the starting track.

(C) Tower, with starting apparatus, for testing models, up to about 60 lbs. in weight.

(D) Sheds for members' machines. The existing sheds appear to be sufficient for present use, but as there is only accommodation for three members, it may possibly be necessary to construct more sheds in the near future.

(E) General improvements to the starting track, viz., increasing its width, forming short extra tracks to suit the wind, etc.

As regards trials, some preliminary tests were made on the central road with Mr. Saul's quadruplane, the machine being driven by its own power, and assisted by a towing motor car. Mr. Saul proposes to use a more powerful motor, and it is to be hoped that he will make his further trials on the starting track, where the conditions for a good start are far more favourable.

Mr. Neale's machine is a monoplane with a double tail; its construction is not yet finished, but he hopes to try the machine on the starting track on an early date.

Major Baden-Powell's machine (of which there is a good model at the Travel Exhibition) is nearly finished. It may possibly be tried on the lake.

Mr. Moreing's machine is now being put together and will also be tried on the water.

DONATIONS AND SUBSCRIPTIONS
TO 30th JUNE, 1908

	£	s.	d.
No. I List	248	18	6

No. II List as follows:

	£	s.	d.
The Mercers' Company (reserved for Research) ..	105	0	0
Mr. C. A. Moreing	50	0	0
Mr. Donnithorne	1	1	0
Mr. M. F. Gascoigne ...	2	0	0
Mr. M. F. Fitzgerald ...	1	1	0
Mr. H. Pither	1	1	0
Mr. E. Pitman	1	1	0
Miss M. Reavely	1	11	6
Mr. C. Lorenzen	1	1	0
Major Moore	1	1	0
Mr. H. Chatley	0	10	6
	£165	8	0

CORRESPONDENCE

Hackney Downs,
May 20th, 1909.

Dear Sir,—I do not wish to break the unwritten law which is to the effect that an author's answer to a discussion is final, but there are several points in Mr. Lanchester's answer to which I am compelled to reply.

In paragraph (1) Mr. Lanchester frankly states that my arithmetic is at fault. Let me correct him.

In the "Aëronautical Journal," October, 1908, p. 116, the diam. of the Wright propeller is given as 9′ 4″. Mr. Lanchester gives it as 8′ 6″. The propeller seemed to me to be about 9′ in diam. Let us take this diameter as being about the mean. The outside diam. of the Farman propeller is 7′ 6″, and the inside diam. to the blades is about 2′ 8″. The Wright machine is 24-H.P. and the Farman 50-H.P.

The area of a 9′ circle = 63.6 sq. ft.
,, ,, 7′ 6″ ,, = 44.2 ,,
,, ,, 2′ 8″ ,, = 5.6 ,,

There are two propellers on the Wright machine and only one on the Farman machine.

$$\frac{\text{Air engaged by propellers of Wright machine}}{\text{Air engaged by propeller of Farman machine}} = \frac{2 \times 63{\cdot}6}{44{\cdot}2 - 5{\cdot}6} = \frac{127{\cdot}2}{38{\cdot}6} = \frac{3{\cdot}3}{1}$$

$$\frac{\text{Air engaged } \textit{per H.P.} \text{ by Wright propellers}}{\text{Air engaged } \textit{per H.P.} \text{ by Farman propeller}} = \frac{3{\cdot}3 \times 50}{1 \times 24} = 6{\cdot}9 \text{ nearly.}$$

This agrees with my statement. It will be seen that Mr. Lanchester appears to have neglected the horse-power and the fact that the Voisin propeller has a central non-acting portion.

I am glad to see that in paragraph (2) Mr. Lanchester has acknowledged that if two propellers are placed axially or in tandem, the hind one should be of larger diam. This is a step in the right direction, namely, placing them *side by side*. For the most efficient working with this disposition the hind propeller would be of a complicated construction. The central portion would have to engage air that has been already accelerated, and would have to impress a further velocity upon it, whereas the outer portion would have to engage undisturbed air. Since all parts of the propeller would revolve at the same speed, the pitch of the inner portion would require to be of considerably greater pitch than that of the other portion. We should thus get an ungainly, impracticable stepped construction.

Mr. Lanchester's remarks in paragraph (7) are a complete verification of my statements. It is well known that the *kinematic dispersion* of a gas is much greater than that of a liquid, or, as I put it before, the loss due to exchange of momentum between two strata of air moving relatively is similar to the exchange of momentum that would result if people jumped from a train going at one speed into another going at another speed. It must be remembered that the velocity of the molecules of a gas is enormous. In the case of air it is somewhere about 2,000 ft. per sec. As a result of this high velocity the attraction of the molecules for one another is entirely overcome, with the result that any quantity of a gas—no matter how small—will expand to fill any space no matter how large. In the case of a liquid the velocity of the molecule is not sufficient *to overcome all influence of molecular attraction*, and thus, in water, we get the phenomena of *surface tension* and *cohesive force*, or, as Sir Hiram and I have put it, "Water wets a surface." The result of this is that, in the case of a ship moving through water, the cohesive force enables a certain quantity of water continually to drag on the side of the vessel. The water has no velocity when the ship first meets it, but due to this drag at the sides it acquires a considerable velocity by the time the vessel has passed, thus giving rise to losses known as skin friction. In the case of air, if the body is well shaped and polished, since there is no appreciable molecular attraction between the air and the body there is not the corresponding drag. The only skin friction which can occur, as previously pointed out, is that due to kinematic dispersion, and would result only if some air were carried along with the plane. We should thus expect to find that rough-shaped bodies, or the like, which trapped a certain amount of air, would have a larger resistance. This is so according to experiment. The losses due to kinematic dispersion for a gas, although greater than for water, are very small in comparison with those due to molecular drag in the case of water, and do not appear to justify Mr. Lanchester's high co-efficient of skin friction which on page 221, Part I., of his book is given, for *small velocities*, as = 0.02 or $\frac{1}{50}$ of the propelling force, when the plane is *normal*. When the plane is inclined it is true that a certain volume of air is continually carried along with the plane, and kinematic dispersion losses occur. These losses increase the head resistance, but cannot be considered as additional skin friction losses.

Maxim, the Wrights, Langley, Kress, Clerk-Maxwell, and others have all said either that the skin friction is exceedingly small, or that it may be safely neglected. In support of these statements it may also be mentioned that a certain very carefully-shaped wooden plane, when mounted at a particular angle,

gave a drift so small that it was not possible to measure it. (See Sir Hiram's book, page 57.)

With regard to Mr. Lanchester's remarks in paragraph (8) on Sir Hiram's propellers, it should be stated that Sir Hiram used, 16 years ago, propellers of 17′ 10″ diam., and would have used propellers of 24′ diam. if it had been possible. (See Sir Hiram's book, page 150.)

Mr. Lanchester's remarks about "the cloven hoof" are quite irrelevant since this is neither a theological nor a zoological discussion. My query as to the air rising up to meet the plane was certainly quite independent of Sir Hiram, and was first raised before I knew that he held the same view. I have known and worked with Sir Hiram for many years, and our views on aëronautical matters agree very well. I, therefore, naturally used in support of my arguments some statements which he has often published during the last 14 years. Since Sir Hiram did not know, in this case, that I intended to join in the discussion of Mr. Lanchester's able and valuable paper, it is a pity that aspersions have been cast upon him.

Yours very truly,

ALBERT P. THURSTON.

Foreign Aëronautical Publications

(In this list a selection of the more notable articles only is given.)

L'Aerophile

April 1st, 1909.—The Wings of Aëroplanes.—A Gyroscopic Pendulum.—The Equilibrium of Aëroplanes.—Fundamental Equations (Drzewiecki).—Notes on Dirigibles.

April 15th, 1909.—The Progress of American Aëroplanes.—"Breguet-Richet No. 2."—"Zeppelin V."

May 1st, 1909.—The Russian Aërodynamical Institute.—Some Aviation Questions (Soreau).—Guns and Dirigibles.—The Recent "Zeppelin" Trials.

May 15th, 1909.—The Hélicoptère Question.—Miscellaneous Aëroplanes (among others, the Weiss).—A Special Compass for Aëronauts.

June 1st, 1909.—Sailing Flight.—Miscellaneous Aëroplanes.—Dirigibles.

June 15th, 1909.—Aërodynamic Research Apparatus (Rateau).—Miscellaneous Aëroplanes.—"Zeppelin II."

Aeronautics (America)

April, 1909.—Soaring Flight (Chanute).—Aërial Experiment Association.—At Morris Park.

June, 1909.—Front and Rear Control of a Machine.—Propeller Mathematics.—Construction Data.

La Revue de l'Aviation

April, 1909.—Stability.—Aërial Screws (several articles).—An Aëronautical Level.—On the Velocity of Translation.

May, 1909.—Aërial Legislation.—The Secret of the Bird.—On the Velocity of Translation.—Trials of Aërial Screws.

June, 1909.—Gliding Flight (Chanute).—Aëronautical Workshops.

Societa Aeronautica Italiana

No. 4.—The Principles of the Conservation of Energy Applied to Aëronautical Work.—Miscellaneous Aëroplanes.—Dirigibles.—Aëronautical Motors.—Scientific Chronicle.

L'Aero-Mechanique

April 10th, 1909.—Considerations on Aërial Navigation.—The Graham-Bell Aëroplane.—The Thrust and Power of Aërial Screws.—Olympia Exhibition.

May 10th, 1909.—Gliding Flight (Chanute).—The Olympia Exhibition.—Notes.

June 10th, 1909.—Gliding Flight.—The International Wing Committee.—Beating Wings.—Notes.

Illustrierte Aeronautische Mitteilungen

April 7th, 1909.—Airship Sheds Design (very well illustrated).—Miscellaneous Notes.

April 21st, 1909.—Aëronautical Work on the East African Expedition.—German Flying Machines.—The "Itala."—Miscellaneous Notes (the Olympia Exhibition).

May 5th, 1909.—Aëronautical Work on the East African Expedition.—Sixth Conference of the International Commission for Aëronautics (Monaco).—Aëroplanes.—The Frankfort Exhibition.

May 19th, 1909.—Dirigibles and Esperanto.—English Notes.—Varieties.—The Frankfort Exhibition.

June 2nd, 1909.—The Theory of Flight; miscellaneous questions.—English Notes.—Varieties.—The Frankfort Exhibition.

Wiener Lufischiffer-Zeitung

April 1st, 1909.—Flights of the "Zeppelin" Balloon.

April 11th, 1909.—The "Zeppelin" Airship.—The Monaco Aërial Conference.—The Teneriffe Observatory.

May 1st, 1909.—The "Zeppelin" Airship. The Victoria-Nyanza Expedition.

May 15th, 1909.—The Aëronautical Commission.—The Frankfort Expedition.

June 1st, 1909.—The Aëronautical Commission.—About the Zeppelin Balloons.

June 15th, 1909.—Airship Societies.—Balloon Meteorology.—The "Zeppelin" Airship.

Applications for Patents

(*Made in April, May, and June*, 1909.)

The following list of Applications for Patents connected with Aëronautics has been specially compiled for the AËRONAUTICAL JOURNAL by Messrs. BROMHEAD & Co., Patent Agents, 33, Cannon Street, London, E.C.

APRIL

7501. March 29th. D. FAKIN. Device for automatically ensuring the stability of aeroplanes.

7503. March 29th. F. E. HODGES and G. M. SELBY. Improved aerial machine.

7524. March 29th. A. DE LA HAULT and J. MIESSI. Improvements relating to the production of mechanical movements, particularly adapted for aerial machines.

7548. March 30th. C. E. RICHARDSON. Improvements in kites.

7666. March 31st. J. L. GARSED. Improvements in the method of and means employed for steering and balancing aerial machines.

7667. March 31st. J. L. GARSED. Improvements in the method of and means employed for steering and balancing aerial machines.

7774. April 1st. T. GRANVILLE. Flying machine.

7782. April 1st. J. D. ROOTS. Improvements in or relating to flying machines.

7987. April 3rd. G. CHAPMAN. Improvements in airships.

7998. April 3rd. W. COOK. Improved aerial machine without aerostat.

8011. April 3rd. V. GRIFFITHS. Improvements in aerial machines without aerostats, aeroplanes, kites, and the like.

8118. April 5th. J. W. DUNNE. Improvements relating to aeroplanes.

8179. April 5th. MOTORLUFTSCHIFF-STUDIENGESELLSCHAFT. Improvements in and relating to sustaining planes for aeroplanes.

8192. April 5th. A. H. STANLEY. Improvements relating to kites.

8282. April 6th. C. J. A. SJOGREN. Improved flying machine.

8285. April 6th. L. G. DAVIES. Improvements in and relating to aeroplanes.

8350. April 6th. I. E. Y. DE LARA. Improvements in andrelating to aeroplanes.

8363. April 6th. R. SCHWARZ and C. W. SANDLES. Improvements in ships for navigating the air.

8407. April 6th. T. W. TWINING. Aeroplane flying machine.

8432. April 7th. H. G. HARGREAVES. Apparatus for automatically balancing aerial machines and the like.

8441. April 7th. O. R. RICHTER. Improvements in or relating to aeronautical machines.

8463. April 8th. F. J. MATEYKA. Monoplane.

8501. April 8th. N. MACNICOLL. Improvements in and relating to the propulsion of marine vessels, the same being applicable to ai ships and the like.

8531. April 8th. S. C. WALKDEN. Improvements in aeroplanes and the like,

8602. April 10th. G. STEVENSON. Flying machine.

8687. April 13th. L B. GOLDMAN. Improvements in aerial machines.

8828. April 14th. G. UNGER. Improvements in or connected with dirigible balloons.

8849. April 14th. F. W. LANCHESTER. Improvements relating to the steering of flying machines.

8866. April 14th. W. BRITAIN. Improvements in flying machines.

9006. April 16th. T. MERINGTON. Improvements in war balloons and the like.

9060. April 16 h. E. B. WEDMORE and F. E. ROBERTSON. Improvements in and relating to flying machines.

9068. April 16th. G. WATTER. Improvements in navigable balloons or airships.

9074. April 16th. J. ROBERTS and F. G. HEALEY. Improvements in and relating to aeroplanes.

9181. April 19th. J. W. HILL and E. E. BURCHATT. Rotary winged aeroplane.

9235. April 19th. H. C. LOBNITZ. Improvements in or connected with aerial machines.

9239. April 19th. R. WAGNER and C. E. VON RADINGER. Improvements in or relating to tubes for air vessels.

9295. April 20th. T. ELLIOT. Improvements in and appertaining to the blades of aerial propellers, fans, and the like.

9303. April 20th. J. BODE. Improved aeroplane.

9321. April 20th. H. G. SCHUMANN. Propelling appliance for aeroplanes or aerostats.

9388. April 20th. E. M. WILDEY. Improvements in screw propellers and more particularly air propellers.

9500. April 21st. E. A. ASHCROFT. Improvements in or relating to balloons and the like.

9512. April 21st. SIR H. S. MAXIM and V. C. VICKERS. Improvements in and relating to flying machines.

9519. April 21st. A. J. BARTLETT. Improvements in and relating to aeroplanes.

9525. April 22nd. R. W. ROGERS. Improvements in aerial mechaniam.

9608. April 22nd. J. MEANS. Improvements in apparatus for launching flying machines.

9609. April 22nd. J. MEANS. Improvements in apparatus for launching flying machines.

9610. April 22nd. J. MEANS. Improvements in apparatus for launching flying machines.

9611. April 22nd. J. MEANS. Improvements in devices for launching flying machines.

9616. April 22nd. H. HARTRIDGE and C. E. A. HARTRIDGE. Improvements in or relating to aeroplanes.

9635. April 23rd. J. H. STOREY. Improvements in flying machines.

9687. April 23rd. J. A. RIGNON. Improvements in and connected with airships.

9805. April 26th. J. GALEA. Electric automatic equilibrium restorer for imparting stability to or improving the stability of aeroplanes, balloons, and other machines for aerial navigation.

9843. April 26th. W. A. POESSLER. Improvements in aeroplanes.

9857. April 26th. F. L. MARTINEAU. Improvements in and connected with aerial navigation.

9989. April 27th. H. C. BARBER. Improvements in aeroplanes.

9990. April 27th. H. C. BARBER. Improvements in flying machines.

10006. April 27th. S. JENKINSON and ANR. Improvements relating to flying machines.

10098. R. ESNAULT-PELTERIE. Improvements in helical propellers particularly applicable for propelling in the air.

10131. April 29th. H. WATSON. Improvements in flying machines.

10142. April 29th. J. W. PEEBLES and ANR. Improvements in aeroplanes.

10154. April 29th. J. POND. Improvements in flying machines.

10193. April 29th. R. F. CHISHOLM. Improvements in and relating to flying machines.

10245. April 30th. F. A. MATTHEWS. Improvements in balancing of flying machines.

10299. April 30th. C. A. ROLLINSON. Improvements in aeroplanes.

10304. April 30th. R. WAGNER and ANR. Improvements in airships.

10306. April 30th. J. WESTAWAY. Improvements in aeronautical machines.

MAY

10347. May 1st. A. P. MAXFIELD. Aeroplanes.

10350. May 1st. B. HIPWELL. Improvements in flying machines.

10422. May 3rd. F. W. LANCHESTER. Improvements in flying machines.

10437. May 3rd. H. RIEDEL. Improvements in flying machines.

10468. May 3rd. SIR C. S. FORBES. Improvements in aeroplanes.

10479. May 3rd. F. LAMPLOUGH. Improved dirigible airship.

10495. May 3rd. G. P. D. SAUL. Improvements in aeroplanes.

10540. May 4th. J. GANT. Improved aeronautical wind gauge.

10761. May 6th. B. SWAN. Improvements in propellers for aerial machines.

10764. May 6th. A. H. NICHOLSON. Improvements in flying machines.

10869. May 7th. E. L. STRIEGLER. Improvements in flying machines.

10875. May 7th. M. VANIMAN and ANR. Aerial machines.

10990. May 10th. R. KENNEDY. Flying machine.

11021. May 10th. J. W. DUNNE. Aeroplane.

11069. May 10th. J. WESTAWAY. Aeronautical machines.

11090. May 11th. E. A. GEOGHEGON and ANR. Improvements in apparatus for aerial navigation.

11100. May 11th. W. C. LOVE. Propellers for aerial and marine vessels.

11141. May 11th. H. E. HUGHES. Improved kite winder.

11153. May 11th. A. J. FREDRIKSON. Improvements in airships.

11197. May 12th. H. PRATT. Improvements in airships, aeroplanes, and the like.

11279. May 12th. E. A. CUNNINGHAM. Improvements in aeroplanes.

11299. May 12th. E. S. JONES and ANR. Aeronautical machines.

11367. May 13th. G. MARTIN. Aeroplanes.

11395. May 13th. F. R. SIMMS. Improvements in aerial machines.

11448. May 14th. J. WAITE. Flying machines.

11498. May 14th. J. D. ROOTS. Flying machines.

11501. May 15th. C. CROMPTON. Steering and balancing of aerial machines.

11504. May 15th. J. WILKINSON and ANR. Aeroplanes.

11523. May 15th. B. STRETTON. Flying machines.

11534. May 15th. S. BROWN. Airships.

11536. May 15th. H. LAMB. Aeroplanes and flying machines.

11638. May 17th. R. WAGNER and ANR. Airships and the like.

11814. May 19th. G. E. Price. Change speed gear for airships.

11819. May 19th. R. C. Haining and Anr. Improved flying machine.

11934. May 20th. Dr. J. Shilling. Improvements in balloons, airships, and the like.

11960. May 21st. F. J. Nyborg. Starting and landing apparatus of flying machines of aeroplane type.

11961. May 21st. F. J. Nyborg. Guiding and governing flying machines of aeroplane type.

11962. May 21st. J. L. Garsed. Aerial machines.

11963. May 21st. J. L. Garsed. Aerial machines.

12003. May 21st. A. H. Swinton. Improvements in aeroplanes and flying machines.

12042. May 21st. W. H. Donner. Aerial locomotion.

12044. May 21st. W. G. B. de Montmorency and Viscount Montmorres. Screw propellers for aeroplanes.

12080. May 22nd. J. L. Garsed. Aerial machines.

12081. May 22nd. J. L. Garsed. Aerial machines.

12163. May 24th. D. Pigot and J. Farbrother. Flying machine for aerial navigation.

12172. May 24th. W. M. Walters. Improvements in appliances for raising and moving bodies in the air.

12186. May 24th. J. Swaddling. Improvements in motors for aeroplanes, or all kinds of light motor vehicles.

12231. May 24th. H. Peuvot. Improvements in or relating to kites for use in connection for shooting, advertising, or for other purposes.

12256. May 24th. A. M. Herring. Flying machine.

12263. May 24th. R. Krause. Airship in completely closed form.

12305. May 25th. J. L. Garsed. Improvements in aerial machines.

12369. May 25th. J. E. Waller and J. G. Statter. Improvements in or connected with flying machines.

12446. May 26th. L. B. de Laitte. Improvements in apparatus for aerial navigation.

12536. May 27th. C. R. and W. R. Green. Improved propeller for use in aerial navigation.

12556. May 27th. T. A. Dring. Improvements in flying machines.

12670. May 28th. R. W. R. Gill. Improvements in aeroplanes.

12728. May 29th. F. H. Page. Improvements in aerial machines such as aeroplanes, aerostats, and the like.

12775. May 29th. J. Schutte. Improvements in airships.

JUNE

12814. June 1st. J. Schutte. Improvements in airships.

12846. June 1st. W. Cochrane. Improved propeller for flying machines.

12856. June 1st. J. Knopp. Dirigible airship.

12907. June 1st. J. A. Steinmetz. Improvements in balloons.

12925. June 2nd. R. C. Sayer. Improvements in boats, submarines, balloons, aeroplanes, and other vessels.

13054. June 3rd. J. H. Kay. Aeronautical apparatus.

13108. June 4th. P. de Crequy. Aeroplanes.

13133. June 4th. D. S. Cox. Balance gears for aeroplanes.

13270. June 7th. R. Walford. Improvements in and relating to airships.

13293. June 7th. O. Coates. Improved construction of aerial machine.

13319. June 7th. F. E. Burne. Improvements in airships or flying machines.

13417. June 8th. J. Schutte. Improvements in or relating to airships.

13418. June 8th. J. W. Dunne. Improvements in controlling devices for aeroplanes, balloons, and the like.

13477. June 9th. R. F. Hall. Improvements in or relating to dirigible balloons or airships.

13608. June 10th. S. Lake. Improved airship.

13618. June 10th. R. M. Rogers. Improvements in airships.

13651. June 10th. J. Placek. Improvements in or relating to dirigible airships.

13670. June 10th. K. L. W. Geest. Improvements in airships or flying machines.

13706. June 11th. J. E. Goddard. Device for assisting the ascent and descent of captive aeroplanes and giving them a switchback motion.

13726. June 11th. J. J. Palmer. Improvements relating to aerial vehicles.

13774. June 11th. P. A. Tarrer and Anderson and Evans, Ltd. Improvements in and relating to aeroplanes.

13791. June 11th. H. Ruthenburg. Improvements in rotary fans or propellers adapted to act upon the air.

13818. June 12th. C. Hamilton. New or improved aeroplane.

13853. June 12th. J. Humphris. Improvements relating to aerial machines.

13965. June 15th. J. Richards. Stability device for aeroplanes, hydroplanes and propellers.

14031. June 15th. S. L. Walkden. Aeroplanes.

14077. June 16th. R. F. Macfie. Water coolers for aeroplanes.

14188. June 17th. J. Humphris. Aerial machines.

14355. June 19th. W. Wragg and Anr. Spring frame for hanger or holder used on aerial flight racer or railway.

14373. June 19th. J. Adams. Flying machine.

14414. June 19th. J. Schutte. Airships.

14434. June 19th. E. T. Willows. Airships and aerostats.

14437. June 21st. S. Mercer. Improved aeroplane.

14438. June 21st. S. Mercer. Improved apparatus for sustaining and propelling aeroplanes and motor balloons, and for propelling water craft.

14476. June 21st. C. H. J. Mackenzie-Kennedy. Improvements in automatically balancing and maintaining the equilibrium and steering of all manner of flying machines.

14494. June 21st. J. Schutte Improvements in or relating to airships.

14519. June 21st. P. Spencer. Improvements in airships or navigable balloons.

14520. June 21st. P. Spencer. Improvements in flying machines.

14583. June 22nd. J. Humphris. Improvements relating to aerial machines.

14638. June 22nd. G. H. Lawson. Improvements in flying machines.

14645. June 22nd. L. Bot and E. Lallemand. Improvements in apparatus for aerial navigation.

14666. June 22nd. J. Hill. Improvements in or relating to dirigible balloons or airships.

14668. June 22nd. R. F. Macfie. Improvements in the automatic balancing of aeroplanes.

14682. June 23rd. W. J. Robinson. Improvements connected with flying machines.

14865. June 26th. A. Henry. Tubular automatic self-balancing aeroplane.

14921. June 26th. P. R. Grace. Improvements in or connected with mechanical flying machines.

14922. June 26th. P. R. Grace. Improvements in or connected with mechanical flying machines.

14927. June 22nd. F. J. Mateyka. Improvements in flying machines.

14958. June 26th. J. Humphris. Improvements relating to aerial machines.

Review

"Flying Machines: Past, Present, and Future," by Alfred W. Marshall, M.I.Mech.E., and Henry Greenly (London: P. Marshall and Co., 1909; 2nd edition, 138 pp.; 1s. net). —This is a revised edition of the book first published in 1907. There have been considerable additions in order to bring it up to date, and it may be recommended as a useful handbook for those wishing to acquire general knowledge of the subject without making any deep study of it. The many illustrations from photographs are clear and well-chosen with the sole unfortunate exception of the picture on the cover, which undoubtedly is meant for a Wright machine, but is not.

Model Aeroplane Competition

A competition for model aëroplanes will be one of the features of a scientific exhibition to be held at the Royal Horticultural Hall, Westminster, S.W., in October next. Small power and model steam, gas, and petrol engines, electric motors, scientific instruments, and workshop appliances, will be among the general exhibits, which should prove interesting to those engaged in aëronautical experiments. Full particulars of the competitions may be obtained from the organisers, Messrs. Percival Marshall and Co., 26-29, Poppins Court, Fleet Street, London, E.C.

The Continental Tyre and Rubber Co. (102-109, Clerkenwell Road) are making small rubber balloons 6 and 8 inches in diameter at the price of 2s. 6d. and 3s. 6d. respectively. These, when inflated, expand to 3 or 4 times their original size, and may be used for meteorological purposes and as "ballons d'essai."

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Representative in England,
Major B. BADEN-POWELL,
27, Chancery Lane, W.C.

ERRATA

Page 119, col. 1, line 35, delete 'of.'

Page 121, col. 1, line 25, for '$\frac{1}{2}$-in. diam.' read '$\frac{1}{8}$-in. diam.'

Page 122, col. 2, line 17, for 'angle of incidence' read 'angle of attack.'

Page 122, Table, under heading 'Constructed by,' for 'Lenteado' read 'Penteado.'